

# Alkaline Recapitulation: Haeckel's Hypothesis and the Afterlife of a Concept

Knox Peden

The Australian National University

THE GERMAN NATURALIST ERNST HAECKEL began many of his works of popular science with a rhetorical trope that was unusual amid the positivism of the late nineteenth century.<sup>1</sup> In the two central books of his career, his *Natural History of Creation* and his *Evolution of Man*, volumes bookended by the ultratechnical *General Morphology* and the ultrapopular *Riddle of the Universe*, Haeckel opened his account with a historical recapitulation of previous attempts to understand the scientific phenomenon in question.<sup>2</sup> In both cases he emphasized the perennial nature of the problem and how it had exercised the minds of generations of thinkers. More important, however, was Haeckel's desire to advance two positions that seemed to him perfectly consonant with one another. On the one hand, there was his conviction that the "simple idea" of Darwinian theory, "that the Struggle for Existence in Nature evolves new Species *without* design, just as the Will of Man produces new Varieties in cultivation *with* design,"<sup>3</sup> did not come out of nowhere but was in many respects anticipated by Goethe, Oken, and Lamarck,

<sup>1</sup> Robert J. Richards, *The Tragic Sense of Life: Ernst Haeckel and the Struggle over Evolutionary Thought* (Chicago: University of Chicago Press, 2008), 227–28.

<sup>2</sup> The two key works of Haeckel's referenced in what follows are his *Anthropogenie; oder Entwicklungsgeschichte des Menschen* (Leipzig: Wilhelm Engelmann, 1874), translated as *The Evolution of Man: A Popular Exposition of the Principal Points of Human Ontogeny and Phylogeny*, 2 vols. (New York: D. Appleton, 1896), and his *Die Welträtsel* (Bonn: Emil Strauss, 1899), translated by Joseph McCabe as *The Riddle of the Universe* (New York: Harper and Brothers, 1900; reprint, Buffalo, NY: Prometheus Books, 1992) (citations refer to the reprint edition).

<sup>3</sup> Haeckel, *Evolution*, 1:95, italics in original.

among others. On the other hand, Darwinian theory was a caesura in the history of science, a breakthrough of such scientific ingenuity as to render all previous speculations on the origins of humankind, not to mention various superstitions about creation, obsolete. Prefiguration and caesura. Total continuity and radical break. If Haeckel discerned a conceptual tension within his own philosophy of scientific history, it was not a concern that was manifested in his work.

But perhaps this is because this conceptual structure—in which the advent of something genuinely novel nonetheless has a prehistory that can be retrospectively discerned in the traces that mark its own epigenesis—is in fact the conceptual structure that is most closely associated with Haeckel's name and legacy: the biogenetic law that states that “ontogeny recapitulates phylogeny.” Haeckel's vision of the embryo restaging the morphological steps of the species in its evolutionary development resonated with multiple nineteenth-century intellectual currents, and it has indeed had a legacy that far exceeds its origins in German naturalism. As Stephen Jay Gould remarks in his book *Ontogeny and Phylogeny*, a pioneering study for his own theory of macroevolution: “[A] testimony to the beguiling appeal of recapitulation can be found in its tenacious survival in casual references of modern humanists, more than half a century after scientists ditched it. ‘Ontogeny recapitulates phylogeny’ is a literary epitome too appealing to resist, whatever its truth value.”<sup>4</sup> Gould quotes a passage from J. G. Ballard's *The Drowned World* to verify his point:

The brief span of an individual life is misleading. Each one of us is as old as the entire biological kingdom, and our bloodstreams are tributaries of the great sea of its total memory. The uterine odyssey of the growing foetus recapitulates the entire evolutionary past, and its central nervous system is a coded time-scale, each nexus of neurones and each spinal level marking a symbolic station, a unit of neuron time.<sup>5</sup>

Gould then traces recapitulation across various domains: criminal anthropology, racism, child development (three discourses that coalesced in General William Westmoreland's remark that “Vietnam reminds me of the development of a child”), and of course psychoanalysis, where phylogenetic speculation exercised a magnetic appeal for Freud. If Freud had some reservations on this score, Sándor Ferenczi had little problem literalizing Freud's “oceanic feeling” in his description of the womb as a recapitulated ocean, invoking for support the empirical datum that the odor of the vagina comes from trimethylamine, the same substance produced by the decomposition of fish.<sup>6</sup>

In all these instances, recapitulation serves primarily as a narrative trope, in Hayden White's sense.<sup>7</sup> A figural representation that also does explanatory work, it endows an isolated event with meaning by tying its advent to deeper structures or antecedents. As a metaphor, recapitulation is indeed ubiquitous. For example, it is rare to find a doctoral work that does not recapitulate its genesis in an acknowledgments section. Typically, one then moves from the ontogeny of the particular book to the phylogeny of a lit. review. But this example—which has nothing to do with the causal substance of Haeckel's hypothesis—also shows how the ubiquity of the figure obscures

<sup>4</sup> Stephen Jay Gould, *Ontogeny and Phylogeny* (Cambridge, MA: Harvard University Press, 1977), 118.

<sup>5</sup> J. G. Ballard, *The Drowned World* (London: Penguin, 1965), 43; cited in Gould, *Ontogeny and Phylogeny*, 118.

<sup>6</sup> Gould, *Ontogeny and Phylogeny*, 126, 163. The key work assessing the relationship between psychoanalysis and evolutionary biology remains Frank J. Sulloway, *Freud, Biologist of the Mind: Beyond the Psychoanalytic Legend*, 2nd ed. (Cambridge, MA: Harvard University Press, 1992).

<sup>7</sup> Hayden White, *Metahistory: The Historical Imagination in Nineteenth-Century Europe* (Baltimore, MD: Johns Hopkins University Press, 1973).

the specificity of the concept. Accordingly, the key task of what follows is to account for this specificity by assessing Haeckel's concept both as a cultural artifact of his Romantic naturalism and as a particular notion of metaphysical causality that has had myriad afterlives, some of which owe no readily discernible debt to his work but are thereby all the more suggestive as a result. Conveniently, the historical and theoretical specifics of Haeckel's biogenetic law are thrown into focus via a contrast with the same proper name: Charles Darwin, the historical figure who revolutionized the tenets of biology and who found in Ernst Haeckel his chief celebrant on the Continent; and Darwin the cipher for a profound disquiet in modern thought that burns through theological appeals to transcendence and makes a mockery of the humanism that remains. This is the Darwin of Daniel Dennett's 1995 volume, *Darwin's Dangerous Idea*.<sup>8</sup>

Taking as a point of departure Dennett's central metaphor of this idea as a "universal acid" that corrodes all it touches, not least the walls designed to contain it, I want to suggest that Haeckel's biogenetic law has a similar function as a universal alkali, one that neutralizes this acid, soothing its corrosive effects. Much as Darwin's cognizance of the acidic quality of his idea is of little concern to Dennett, I am less interested in Haeckel's intention in developing his biogenetic law than in its conceptual genealogy and its resonance with a variety of contemporary theoretical projects. I use the language of "resonance" deliberately, because my claim about contemporary theory is not one of influence or an overlooked genealogy. My aim is to make manifest the causal schema of Haeckel's hypothesis and to suggest that variations on this schema can be discerned in much theoretical rhetoric today, especially in ostensibly new materialisms, vitalisms, and naturalisms. To this end, my discussion of Haeckel is divided into two sections. In the first part, I will follow Robert Richards's lead in exploring the historical roots of Haeckel's project in European Romanticism. Richards contends that the "romantic conception of life" is the redemptive kernel of Haeckel's project and the source of Darwin's own sense of "grandeur."<sup>9</sup> It is precisely these Romantic components that work as a rhetorical counterweight to the destitution of meaning accomplished by natural selection in the terms of Dennett's account. To be clear, this is not a claim about the correctness or incorrectness of Richards's view of evolutionary biology's morphological history, "the romantic conception of life," or even natural selection itself as a concept. It is to suggest, rather, that the persistence of a Romanticist valorization of nature as a source of productivity to our own day helps to account for the historically alkaline function of the conceptual structure of Haeckel's biogenetic law, even if its resurgence owes no patent genealogical debt to Haeckel. In this regard, Carl Schmitt's distinctive concept of Romanticism will complement Richards's cultural historical account in order to yield a firmer purchase on the specifics of Haeckel's position and its capacity to assume myriad guises.

With this genealogy established, the goal will then be to identify what distinguishes Haeckel's concept as an explanatory mechanism from the figures of recapitulation enumerated thus far. For Haeckel, recapitulation was not simply a recurrent form—a "dialectics of nature" in Engels's expression—that took place analogically at various levels of existence. Rather, Haeckel's point was to emphasize the causal—indeed, the mechanical—relationship *between* phylogenetic

<sup>8</sup> Daniel C. Dennett, *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (New York: Simon and Schuster, 1995).

<sup>9</sup> Richards's intellectual biography of Haeckel was preceded by a broader investigation of the roots of his project in early nineteenth-century German Romanticism, science, and *Naturphilosophie* in Robert J. Richards, *The Romantic Conception of Life: Science and Philosophy in the Age of Goethe* (Chicago: University of Chicago Press, 2002). On Darwin in particular, see 514–54.

and ontogenetic levels. In his *Evolution of Man*, Haeckel supplements the recapitulation formula with the equally laconic claim that “phylogeny is the mechanical cause of ontogeny,”<sup>10</sup> a statement whose meaning is much more elusive than it appears. The biogenetic law aims to tie the proliferation of discrete species to the metaproliferation of distinct organisms. But in this case the latter is not so much the cause as the sign of the former. In other words, the embryonic ontogenesis of the organism is the documentary evidence that Haeckel “reads” to discover the phylogenetic history of the species and, ultimately, creation as such. Central to this view is the way the temporal compression of ontogenesis gets spatialized in a series of images of embryonic development, a compression that results from the combined pressures of palingenesis and cenogenesis, two concepts that will be defined and unpacked later on.<sup>11</sup> This contraction sets up a peculiar logic, however, whereby the more gaps there are in the series, the more the phylogenetic history signified in the embryonic timeline is visually compressed. The human becomes at once as close as possible to a primordial nature and the apotheosis of that nature as its highest product as of yet. For the time being at least, Man gets to have it both ways, as both the origin and the goal; here, the meaninglessness of Darwinian destitution is transcended in a recapitulative gesture that restores sense to the linear inexorability of natural selection.

### **VITALISM, MATERIALISM, AND THE IDEALISM OF “UNIVERSAL ACID”**

Before addressing the particulars of Haeckel’s concept, a few more words about what motivates this inquiry are necessary, as is a brief justification of its reliance on Dennett’s volume. Charles Darwin would have seemed an unlikely avatar of theoretical antihumanism thirty years ago. Recently, however, thinkers inspired by Gilles Deleuze and the resurgence of interest in vitalism that his work has brokered have initiated an engagement with evolutionary biology that would have been anathema in the heyday of “Theory.”<sup>12</sup> Elizabeth Grosz has been one of the leading lights of this effort, and also the most explicit about the need for a theoretical engagement with Darwinism. For Grosz, the stakes are high:

We have forgotten where we come from. This is a double forgetting: of the elements through which all living things are born and live, a cosmological element; and of the specific body, indeed a chain of bodies, from which we come, a genealogical or maternal element. Life is this double debt, and its forgetting is the condition under which the living perhaps come to know the world though not understand themselves.<sup>13</sup>

The ethical imperative of Grosz’s work is clear: to pursue the consequences of linguistic and psychoanalytic antihumanism further by sapping humanity of all its privileged claims, including its capacity for language, in a renewed naturalism that grounds humanity in affective life rather

<sup>10</sup> Haeckel, *Evolution*, 1:72.

<sup>11</sup> See Scott Ferguson, “The Face of Time between Haeckel and Bergson; or, Towards an Ethic of Impure Vision,” *Qui parle* 19, no. 1 (Fall/Winter 2010): 107–51. N.B.: In the English translation of *Anthropogenie, The Evolution of Man*, the orthography of “cenogenesis” and its variants is in fact “kenogenesis.” I have used “cenogenesis” to remain consistent with Gould’s usage and with the most common spelling of the concept in the current literature.

<sup>12</sup> See Martin Hägglund, “The Arche-Materiality of Time: Deconstruction, Evolution, and Speculative Materialism,” in *Theory after “Theory,”* ed. Jane Elliott and Derek Attridge (London: Routledge, 2011), 265–77.

<sup>13</sup> Elizabeth Grosz, *The Nick of Time: Politics, Evolution, and the Untimely* (Durham, NC: Duke University Press, 2004), 2.

than cognitive intelligibility. In Grosz's view, "Darwin has effected a new kind of humanity, . . . a fleeting humanity whose destiny is self-overcoming, a humanity that . . . returns to those animal forces that enable all life to ceaselessly become."<sup>14</sup> Though Darwin is clearly Grosz's touchstone, the wager here is that her conception of nature as a restorative plane of existence results in a Romantic conception of Darwinism for which Haeckel was and remains the greatest exponent. Indeed, Haeckel is virtually never cited in today's "new materialism," in which, in addition to Deleuze, references to Henri Bergson and Gilbert Simondon abound.<sup>15</sup> This current of thought seeks to expand the scope of vitalizing nature, imbuing it with causal powers, not in the mechanical sense of cause and effect, but as a kind of Spinozistically conceived "immanent cause" responsible for nature's myriad products.<sup>16</sup>

Haeckel himself was an admirer of Spinoza's thought and considered his own monism to be consistent with the latter's naturalism. One of the chief members of the Monist League, Haeckel was in certain respects representative of the broader resurgence of interest in Spinozism in late nineteenth-century Germany.<sup>17</sup> In this regard, the contemporary interest in a particularly Spinozist naturalism that is deemed consonant with various vitalisms need not cite Haeckel for there to be Haeckelian elements discernible in it. For example, Deleuze never mentions Haeckel, but the conceptual similarity is nonetheless clear. In a late text, Deleuze presented the relationship between the virtual and the actual—arguably the core distinction of his metaphysics—in the following terms: "Actualization belongs to the virtual. The actualization of the virtual is singularity whereas the actual itself is individuality constituted. The actual falls from the plane like fruit, whilst the actualization relates it back to the plane as if to that which turns the object back into a subject."<sup>18</sup> Like Ballard's vision of our bloodstreams as the "tributaries" of evolutionary history, Deleuze's philosophy isolates the actual entity, which we might correlate with the embryo, as the fruit of a virtual plane that can be correlated with the entire evolutionary history of "Life." In Deleuze's project, as well as those he inspired, this relation is as much causal as it is descriptive.

<sup>14</sup> Elizabeth Grosz, *Becoming Undone: Darwinian Reflections on Life, Politics, and Art* (Durham, NC: Duke University Press, 2011), 24.

<sup>15</sup> See, among others, Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke University Press, 2010); Diane Coole and Samantha Frost, eds., *New Materialisms: Ontology, Agency, and Politics* (Durham, NC: Duke University Press, 2010); William E. Connolly, *A World of Becoming* (Durham, NC: Duke University Press, 2011); Elizabeth Wilson, *Psychosomatic: Feminism and the Neurological Body* (Durham, NC: Duke University Press, 2004). One of the pioneering works in this field was Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham, NC: Duke University Press, 2002). Cf. Ruth Leys, "The Turn to Affect," *Critical Inquiry* 37, no. 3 (Spring 2011): 434–72. Leys's critique of "affect theory" focuses mainly on the limitations—in terms of both empirical bases and ethical consequences—that she sees in the foundational work of Sylvan Tomkins and others in experimental psychology. She shrewdly avoids engagement with the philosophical elements that have accompanied the reception of this work in the humanities. Nevertheless, she argues that claims to a monistic outlook among new materialists are belied by an emphasis on affect that grants causal privilege to a material substrate that ends up being conceptually distinct from the "mind" that cognitively registers effects (including those produced by affects). The result, she argues, is a new dualism, now to the profit of the "body" over the "mind" (or the material over the ideal). At the heart of the dispute between Leys and her targets (and now, reciprocally, her critics) is an equivocal usage of causality, one that an assessment of Haeckel's recapitulation hypothesis might serve to clarify.

<sup>16</sup> See Hasana Sharp, *Spinoza and the Politics of Renaturalization* (Chicago: University of Chicago Press, 2011). Cf. Knox Peden, *Spinoza Contra Phenomenology: French Rationalism from Cavaillès to Deleuze* (Palo Alto, CA: Stanford University Press, 2014).

<sup>17</sup> Tracie Matysik, "Spinozist Monism: Perspectives from within and without the Monist Movement," in *The Riddle of Monism*, ed. Todd Weir (New York: Palgrave, 2012).

<sup>18</sup> Gilles Deleuze and Claire Parnet, *Dialogues II* (New York: Columbia University Press, 2007), 149–50.



The virtual is the causal source of the actual. But it is only by reading the actual in its temporal development that we gain some sort of intellectual access to the virtual plane that subtends it, and can thereby enhance the capacities of the “actual” to expand the “virtual’s” remit. In a similar way, the ontogenetically resultant individual is regarded as the (actual) sign of the (virtual) phylogenetic process that generated it and whose importance exceeds it.

If it is insufficient to view recapitulation as a merely rhetorical figure in modern thought, it is because this figure does conceptual, explanatory work in a variety of projects. Beyond this explicitly vitalist current, we also have Bernard Stiegler’s overt allusion to Haeckel in his claim that “socio-genesis recapitulates techno-genesis.”<sup>19</sup> Influenced by Derrida, for whom of course there was nothing “mere” about rhetoric, Stiegler argues that the technical relation to the world occasioned by temporal *différance* is constitutive of the human as such, and that moreover this ontological condition is recapitulated in the second-order incompleteness that is constitutive of the “social body.” And then there is Alain Badiou’s recent lobbying for a renewal of the “communist hypothesis,” a position prefigured in his presentation of a historical series of recapitulated Spartacisms in *Logics of Worlds*.<sup>20</sup> Brazenly elevating myth above history, Badiou sees in each revolutionary “advance” a recapitulation of the communist hypothesis, redeeming past failures in a failure that “fails better” each time. Though Haeckel’s vital naturalism is about as far from Badiou’s astrigent formalism as one can get, there is a striking thread that ties the two together: accumulating evidence that seems to weaken the “hypothesis”—be it the biogenetic law or a practicable universal egalitarianism achieved by revolutionary means—serves only to fortify the conviction of its proponents.

In this sense, perhaps the seduction of recapitulation as a figure functions above all as an index of the desire to have it serve as a cause, understood in the dual sense of an explanation and a project to be pursued and maintained. On this score, it is worth observing that the father of phenomenology, Edmund Husserl, who had little patience for the naturalism and realism of a Haeckel, nevertheless conceived of the pinnacle of scientific thought as one that restages its historical genesis.<sup>21</sup> This is, after all, the agenda of “The Origin of Geometry”: the only way to recuperate or redeem science is to recapitulate its genesis out of the lifeworld. In this instance, the historical failure of Haeckel’s biogenetic law as a scientific fact lives on as a philosophical norm; failing as cause, it persists as cause célèbre. In most variants of phenomenological existentialism, maximal authenticity has a maximal recapitulation as its precondition. Haeckel’s brand of antihumanism is a double-edged sword that prefigures this fractured development, in which the failure to achieve a complete or adequate recapitulation serves as the impetus to keep trying. He opens *The Riddle of the Universe* heralding a key consequence of the Darwinian project: namely, that man can no longer be considered the apotheosis of creation.<sup>22</sup> In the same stroke, however, Haeckel fortifies the notion of the apotheosis as such, enhancing its desirability all the more by making it an object of an endless evolutionary deferral.

<sup>19</sup> Bernard Stiegler, *Technics and Time, 2, Disorientation*, trans. Stephen Barker (Palo Alto, CA: Stanford University Press, 2009), 2. Cf. Bernard Stiegler, *Technics and Time, 1, The Fault of Epimetheus*, trans. Richard Beardsworth and George Collins (Palo Alto, CA: Stanford University Press, 1998), 140.

<sup>20</sup> Alain Badiou, *The Communist Hypothesis*, trans. David Macey and Steve Corcoran (London: Verso, 2010). Cf. Alain Badiou, *Logics of Worlds: Being and Event, 2*, trans. Alberto Toscano (London: Continuum, 2009), 62–69.

<sup>21</sup> Edmund Husserl, *The Crisis of European Sciences and Transcendental Phenomenology*, trans. David Carr (Evanston, IL: Northwestern University Press, 1970).

<sup>22</sup> Haeckel, *Riddle*, 12.

Much ink has been spilled debating Haeckel's relationship to Darwin, both theoretically and historically, with a specific focus on these progressivist and teleological notions in Haeckel's thought. Whereas many have seen Haeckel as the midwife of all that is pernicious in the Darwinian legacy, from imperialist apologetics to Nazi eugenics, Robert Richards has sought over the last two decades to rehabilitate Haeckel's status in European intellectual history.<sup>23</sup> The integrity of Richards's position is based on his claim that by presenting Haeckel's conceptual proximity to Darwin, he is also presenting a truer historical picture of Darwin, one that ties him closer to his Continental brethren rather than shielding his project from their speculative zealotry. In this respect, Richards by and large succeeds. He resituates the Darwinian project in its own historical age and by the same measure recuperates Haeckel's status as a contributor to that project. And yet there are other productive ways to talk about the historical relationship between Darwin and Haeckel. The approach taken here focuses on the conceptual rather than the personal and takes its cue from Dennett's unapologetic defense of "Darwin's dangerous idea."

In addition to the pervasive "hermeneutics of condescension," to use Marilynne Robinson's felicitous phrase,<sup>24</sup> the most striking aspects of Dennett's volume are its completely unreflective use of metaphor and its relentless aversion to historicism. But it is precisely, if ironically, *because* of the shameless idealism or indeed formalism of Dennett's method that this is an important work for historians to take seriously. In contrast to Richards's ultrareflective method of restaging the morphological development of evolutionary theory, in effect having his object determine his approach, Dennett performs an idealist extraction of "Darwin's dangerous idea" from its context, including the context of Darwin's own pronouncements and opinions about what he was doing and saying. Dennett is apparently unfazed by charges of essentialism, and what is more, this notion of extracting the essential kernel of an idea is ultimately but one metaphor among many. In addition to the notion of "universal acid," there is also Dennett's famous comparison of skyhooks and cranes as explanatory devices and philosophical principles.<sup>25</sup> Darwin gives us a thoroughgoing materialist or immanent way to construct complexity with firmly moored cranes; no recourse to transcendental skyhooks is required. But these two metaphors—of acid and of skyhooks versus cranes—are predicated on a third, which is in fact the core of Dennett's own argument: namely, that Darwin's idea is an *algorithm*.<sup>26</sup>

According to Dennett, the Darwinian theory of natural selection is so dangerous, and so acidic, because it is thoroughly algorithmic, which is to say that it operates irrespective of its

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<sup>23</sup> Daniel Gasman, *The Scientific Origins of National Socialism: Social Darwinism in Ernst Haeckel and the German Monist League* (New York: Science History, 1971); Daniel Gasman, *Haeckel's Monism and the Birth of Fascist Ideology* (New York: Peter Lang, 1998). More judicious, but still contentious, accounts are provided in André Pichot, *The Pure Society: From Darwin to Hitler*, trans. David Fernbach (London: Verso, 2009); and Richard Weikart, *From Darwin to Hitler: Evolutionary Ethics, Eugenics, and Racism in Germany* (London: Palgrave, 2004). Cf. Richards's appendix to *Tragic Sense of Life*, titled "The Moral Grammar of Narratives in the History of Biology—the Case of Haeckel and Nazi Biology," 489–512.

<sup>24</sup> Marilynne Robinson, *Absence of Mind: The Dispelling of Inwardness from the Modern Myth of the Self* (New Haven, CT: Yale University Press, 2010), 14.

<sup>25</sup> See in particular chapter 3, "Universal Acid," in Dennett, *Darwin's Dangerous Idea*, 61–84. These metaphors also number among many others in Daniel C. Dennett, *Intuition Pumps and Other Tools for Thinking* (New York: W. W. Norton, 2013).

<sup>26</sup> Stephen Jay Gould criticizes the metaphoric quality of the "algorithm" in Dennett's book in his review, "Darwinian Fundamentalism," *New York Review of Books*, June 12, 1997. But its metaphoric quality—a tool for thinking—is of course part of the point.

inputs and treats the universe as a whole as an instance of substrate neutrality.<sup>27</sup> Dennett enumerates multiple examples of algorithmic inexorability, but one of the most striking is his example of finding the man who can win fifty coin tosses in a row.<sup>28</sup> We spontaneously find this incredibly unlikely; but it is easy enough if the man has one thousand accomplices. You simply establish a tournament with fifty stages of narrowing brackets, narrowing the competitors to the final two, and the final winner, who succeeds at winning his fiftieth toss. Dennett's point, however, is precisely that this is not winning at all—once begun, there is no introduction of design—and that the “winner” is not found but rather *produced* by the algorithm that is the tournament bracket.

What is important about this example is the way it effectively narrativizes the absence of narrative. The inexorable necessity of the tournament bracket operates *independently* of the contingency of each coin toss; and yet that contingency is the mechanism of this necessity's advance. In effect, Dennett strikingly formalizes natural selection as a wholly *nonqualitative* affair. There is no sense of improvement, or betterment, words that cannot but connotatively accompany the notion of “adaptation.” What is ultimately relevant here are not Dennett's earnest attempts to develop a viable ethics out of his cranes<sup>29</sup> but the conceptual consequences of his own “idea”: namely, that natural selection cannot coherently serve as a source of meaning or value. Instead, it suggests their destitution within a naturalist perspective.<sup>30</sup>

Dennett became an unwitting cultural historian dealing with the flurry of responses to his book in the late 1990s, effectively proving his point about the historically acidic nature of Darwin's idea. But Haeckel's recapitulation hypothesis has long existed alongside natural selection as its historical antidote, dating from the key role Haeckel played in the dissemination of Darwinism worldwide. To grasp the conceptual complementarity between Darwin's acid and Haeckel's alkali now requires a look at the gestation of Haeckel's biogenetic law and its roots in German Romanticism.

## ROMANTIC LIFE AND “SUBJECTIFIED OCCASIONALISM”

The uneasy coexistence in Haeckel's thought of Romantic and mechanical conceptions of causality helps explain the fascination of his work for some and its incoherence for others. Indeed, at once artist and scientist, Haeckel plays a crucial role in Lorraine Daston and Peter Galison's study of the history of objectivity as a liminal figure between an ideal of “truth to nature” and that of mechanical objectivity. Referencing and reproducing some of Haeckel's exquisite drawings of life-forms in nature, they write:

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<sup>27</sup> Dennett, *Darwin's Dangerous Idea*, 52–60.

<sup>28</sup> *Ibid.*, 53–56, 179–80.

<sup>29</sup> See, e.g., Daniel C. Dennett, *Freedom Evolves* (New York: Penguin, 2003).

<sup>30</sup> For an alternative analysis of a narrative that in fact undermines narrative, see Hayden White's assessment of Tolstoy in “Against Historical Realism: A Reading of *War and Peace*,” *New Left Review* 46 (July/August 2007): 89–110. A signal aspect of White's tropology is his insistence that figurative tropes are, at root, schemas of metaphysical causality. But his concern for efforts to rework figural rhetoric to undermine narrativity and metaphysics has often been overshadowed by a focus on the moral voluntarism that shapes his investment in narrative's “positive” (for lack of a better word) uses. The countervailing concern to de-narrativize is evident in his analysis of *The Annals of Saint Gall* as a chronicle in which there is no evident connection among the events that provide its contents. See “The Value of Narrativity and the Representation of Reality,” in his *The Content of the Form* (Baltimore, MD: Johns Hopkins University Press, 1987), 1–25. It is evident too in his conclusions regarding Tolstoy: “History is not something that one understands, it is something one endures—if one is lucky” (“Against Historical Realism,” 110), “lucky,” that is, like the victor of Dennett's tournament.



His version of truth-to-nature was altered by the very existence of—and sometimes rivalry with—mechanical objectivity. Haeckel's arguments and persona were pressed into the plane defined by the axes of objectivity and subjectivity. His spirited defense of “ideas” in images went hand-in-hand with an intense appreciation of the aesthetics of natural forms. . . . In the days of Goethe or Audubon, there would have been nothing jarring about the partnership of truth and beauty. But once framed by the opposition between objective science and subjective art, Haeckel's preoccupations made him seem eccentric—an artist in scientist's clothing.<sup>31</sup>

Where Daston and Galison see rivalry and eccentricity, Robert Richards sees complementarity and consummation. Indeed, Ernst Haeckel stands as the inheritor of German Romanticism and *Naturphilosophie*, the thinker who redeemed many of the latter's speculative insights by integrating them into Darwinian theory. In two volumes devoted to the subject, Richards tracks the complementarity of aesthetic sensibility and scientific prowess among the Romantics, before presenting a comprehensive intellectual biography of Haeckel as their apotheosis.<sup>32</sup> Richards's genealogical argument has recourse to a variety of figures. First, from Goethe, Haeckel inherited an aesthetic appreciation of form and a conviction that form could be scientifically grounded in nature. Goethe's quest for the *Urpflanze* of all plants in Italy was not a Platonist conceit but a source of inspiration for Haeckel's own conviction that the power of recapitulative figuration could be found in the fossil record, as well as in embryogenesis.<sup>33</sup> Second, if Kant's subject was transcendental and Hegel's was absolute, Schelling's was unambiguously nature itself. And if Goethe instilled in Haeckel a love of form, Schelling provided the rudiments of a concept of nature that explodes form in its exuberant productivity.<sup>34</sup> The corrosion of form toward a night in which all cows are black dovetailed nicely with Haeckel's vision of constant morphological transformation. Finally, with Lorenz Oken one finds the delectable concept of *Urschleim*, a kind of historically proto-protoplasm, as well as a homological conception of anatomy, which was central both to his contributions to cell theory and his vertebrate theory of the skull, in which the skull is the homologue of the trunk.<sup>35</sup> Indeed, one way to view Oken's own work in comparative anatomy is as a scientific correlate to Schelling's notion of the all-in-all. Oken's vital universe is basically a set of Russian matryoshka dolls; homology all the way down.

According to Richards, these and other related strands were synthesized in Haeckel's appropriation of Darwinian evolution. But despite Richards's cultural focus, Romanticism is such a capacious category for him that it ultimately seems tantamount to little more than a love of nature combined with an aesthetic sensibility. Insofar as he finds these elements in Darwin, he is able to describe his thought as consistent with a Romanticist current in European thought as well. With Haeckel the case is more obvious, with a fondness for nature easily sliding into nature worship in many instances. Schopenhauer once described pantheism as only a polite form of atheism, a formulation Haeckel cites himself.<sup>36</sup> But for Haeckel nature was inherently productive and generative, throbbing with a vital force. He insisted time and again that his monism was not to be

<sup>31</sup> Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), 247.

<sup>32</sup> The two volumes are Richards's *Romantic Conception of Life* and his *Tragic Sense of Life*.

<sup>33</sup> Richards, *Romantic Conception of Life*, 325–508; Richards, *Tragic Sense of Life*, 30–38, 120.

<sup>34</sup> Richards, *Romantic Conception of Life*, 114–92; Richards, *Tragic Sense of Life*, 33–34.

<sup>35</sup> Richards, *Tragic Sense of Life*, 464–71.

<sup>36</sup> Haeckel, *Riddle*, 291.

confused with materialism, that his “law of substance” granted equal dignity to Spinoza’s two substantial attributes of Thought and Extension.<sup>37</sup> The protoplasm of matter correlated in each instance with the “psychoplasm” of consciousness.<sup>38</sup> Haeckel’s method is a classic case, however, of the homunculus problem, of the displacement of causality into ever more elusive concepts and more primordial forms. And in the last instance, Haeckel always returned to the singularly generative and productive quality of nature itself as a life-giving force or energy.<sup>39</sup> In the section of *The Riddle of the Universe* titled “Our Monistic Ethics,” in which we would expect to find at least an element of Spinozistic asceticism, Haeckel writes: “In the school of the future nature will be the chief object of study; a man shall learn the correct view of the world he lives in; he will not be made to stand outside of and opposed to nature, but be represented as its highest and noblest product.”<sup>40</sup>

From passages like this, it is clear that the screed against the Catholic Church that constitutes a good portion of *The Riddle of the Universe* is designed to produce, not a new humanism, but rather a new naturalism wherein the human is, to be sure, nature’s highest and noblest product, but merely a product all the same. This notion of “product” is crucial, however, and in order to grasp what is historically important about Haeckel’s synthetic accomplishment, it is useful to turn to a theorist of Romanticism who deliberately attempted to move past the capaciousness of the category in order to determine the specificity of the concept. In his 1919 volume *Political Romanticism*, Carl Schmitt sought to formalize the Romantic as a historical type or persona, in effect a form that could accommodate multiple contents, political or otherwise. In the end, Schmitt defines the modern figure of Romanticism as “subjectified occasionalism.”<sup>41</sup> Unlike the occasionalism of a Malebranche, in which the universe exists as an occasion for God’s will, in Romanticism the world becomes the occasion for the ego’s, rather than God’s, productivity. Schmitt writes:

The romantic attitude is most clearly characterized by means of a singular concept, that of the *occasio*. This concept can be rendered in terms of ideas such as occasion, opportunity, and perhaps also chance. It acquires its real significance, however, by means of an opposition. It negates the concept of *causa*, in other words, the force of a calculable causality, and thus also every binding norm. It is a disintegrative concept. This is because everything that gives consistency and order to life and to what takes place—regardless of whether it is the mechanical calculability of the causal, or a purposive or normative nexus—is incompatible with the idea of the merely occasional.<sup>42</sup>

At a glance, this passage seems incompatible with the version of Romanticism that Haeckel himself identified with and the one promulgated today by Richards, in which nature functions as the immanent cause of its own productivity.<sup>43</sup> It also seems to go against Haeckel’s own man-

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<sup>37</sup> Ibid., 211–32.

<sup>38</sup> Ibid., 90–91.

<sup>39</sup> Ibid., 288.

<sup>40</sup> Ibid., 363.

<sup>41</sup> Carl Schmitt, *Political Romanticism*, trans. Guy Oakes (Cambridge, MA: MIT Press, 1986), 17.

<sup>42</sup> Ibid., 16–17.

<sup>43</sup> Cf. David J. Depew and Bruce H. Weber, *Darwinism Evolving: Systems Dynamics and the Genealogy of Natural Selection* (Cambridge, MA: MIT Press, 1995), esp. 169–91. Depew and Weber emphasize Haeckel’s naturalism and Lamarckian developmentalism over any debt to Romanticism per se. “Transmutations and common

ifest commitment to “mechanical causality” and the specific conviction that “phylogeny is the mechanical *cause* [italics added] of ontogeny,” in other words, that it is the adaptive advance of the species that “gives consistency and order” to discrete individuals. But we can see why Schmitt’s argument is germane if we consider it in light of a striking paradox that results from Dennett’s unabashed mixing of metaphors.

On the one hand, the notion of universal acid seems to connote a destruction or corrosion of form. On the other hand, however, the metaphor of the algorithm functions precisely as the bestowal of determinate form. This same duality is also present, as we have already seen, in Haeckel’s Romantic genealogy, in the contrasting influences of Goethe and Schelling. It is a cultural duality that Schmitt remarks upon himself; Romanticism was an age of “new life and a true poetry”—that is, a bestowal of poetic form on the world. But it also appears “as a wild outbreak of morbid sensibility and a barbaric incapacity for form.”<sup>44</sup> Given his ultimate recourse to “subjectified occasionalism,” it is clear that Schmitt finds the duality to be asymmetrical, breaking toward the negation of form rather than its persistence. Likewise, if the key to Darwinism’s acidity is precisely, if paradoxically, its relentless *bestowal* of form through the constraints of algorithmic natural selection, then Haeckel’s recapitulation hypothesis finds its alkalinity in its “barbaric incapacity for form.” There is, to be sure, a further conceptual irony here when we consider Haeckel’s own aesthetic appreciation of form and his obsession with morphology. But the asymmetry reasserts itself in the last instance; the essence of Haeckel’s biogenetic law is the eternally repeated return to the primordial absence of form, protoplasmic *Urschleim*, as a regenerative corrective to the relentless linearity of natural selection.

### “THE THREAD OF ARIADNE”

This is not to pretend that there are no signs of recursion in the advent of each organism; the beginnings of the human fetus as a single, synthesized cell, its embryonic stages, and its fleeting gills are there for all to see. At this point, however, we have to consider Haeckel’s specific causal arguments for the relation between ontogenetic and phylogenetic levels and the figuration of time that this relation relies upon. If Schmitt insists upon the fact that the subjectified occasionalism inherent in Romanticism is the ruin of the causal, the purposive, or the normative, then Haeckel provides us with a naturalized occasionalism. The world is the occasion for nature’s productivity; life is the means; and binding norms are dissolved to the profit of nature’s whims. This view clearly runs counter to a vision of algorithmic causality as, precisely, a *binding* norm. If the disintegration of cause appears in Haeckel’s work when viewed through Schmitt’s prism, it is equally striking to see the key role that the vacuity of Haeckel’s causal perspective plays in Gould’s own assessment of ontogeny and phylogeny.<sup>45</sup> Indeed, the cornerstone of Gould’s study is the claim that biology after Haeckel has witnessed the transformation of the biogenetic law from an explanans into an explanandum. The recapitulation of prior stages does not explain the forward advance of a given species or individual; rather, this evidence of an apparent recapitulation is what demands an explanation. That is, why are certain features preserved? What explains the

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descent,” they write, “were significant to Haeckel because they backed up reductionist materialism by forbidding any external agents from entering the history of life” (174). But it is this focus on the singularity of life as a self-causing agent in Haeckel that gives his naturalism precisely a Romantic cast.

<sup>44</sup> Schmitt, *Political Romanticism*, 4.

<sup>45</sup> Gould, *Ontogeny and Phylogeny*, 69–114, 167–206.

differential temporalities that account for the emergence of particular features among embryos that appear all too similar at the outset?

Central to Gould's critique of the biogenetic law is his reminder that the essence of Haeckel's claim is not simply that all emergent life recapitulates the instance of a single cell and moves through visually similar stages of development before branching off in species-specific differentiations. This was in fact the claim of Karl Ernst von Baer, whose views were opposed to Haeckel's and arguably much closer to Darwin's. Rather, Haeckel's view was that in its epigenetic development an organism recapitulates the *adult* stages of other species in its phylogenetic history. This is clearly a much more radical claim, one that leads Gould into his discussion of the putatively causal element in Haeckel's thesis. Phylogenetic progress is an accelerative phenomenon, one that compresses time and history in the epigenesis of singular individuals. In a word, it exerts *pressure*; it is a *force*. In its effort to improve its adaptive success, the species as a whole is the subject of a phylogenetic procedure for which ontogenetically discrete individuals are simply the means. Haeckel sees in this tendency to condensation that takes place on the ontogenetic level the cause of both recapitulation as such and its role as a causal mechanism between phylogeny and ontogeny. But, again, it doesn't take a Humean skeptic to see that the use of the word "cause" here obscures the absence of precisely any established causal relationship. Indeed, in one of Gould's many swipes at Haeckel, he writes: "Although he inundates us with assurances that recapitulation has a 'simple,' 'inevitable,' and 'mechanical' explanation, he seems singularly uninterested in it."<sup>46</sup>

And it is precisely here that the Schmittian and Gouldian perspectives—an odd pairing, no doubt—nevertheless meet: in a word, the repeated recourse to cause obscures the total absence of cause. Jacques Lacan said something similar when he remarked on the meaning of cause in the observation that the phases of the moon cause the tides. "There is only cause in that which doesn't work" (*il n'y a de cause que de ce qui cloche*).<sup>47</sup> According to Richards, Gould's suggestion that Haeckel was unique in making a case for the causal mechanism of recapitulation of adult stages is a flagrant misreading of the logic of adaptation in Darwin. Morphological modifications are acquired during the adult stage; this is at once the stage where natural selection exerts its pressure and the moment of what would later be recognized as genetic transmission to the next generation. In Richards's words: "For Darwin it was adults all the way down—when embryos manifested traits acquired by progenitors, it had to be the adult traits they manifested. Embryos thus had to pass through the *adult* stages of their ancestors."<sup>48</sup>

Again, the goal is not to adjudicate the Darwin wars but to emphasize what is specific about the perspective Haeckel brings to Darwinism. Regardless of clues in Darwin's own writings that suggest he saw embryogenesis as providing insight into phylogenetic history, it is clear that Haeckel sought to develop a full-blown theory in which the embryo, rather than the fossil record, was the primary source document of evolutionary history. Central to his theory was the distinction between palingenesis and cenogenesis, the two components of embryogenesis as such. The "palingenetic process" is the reproduction of the "tribal" history of the "germ," or the species

<sup>46</sup> Ibid., 83.

<sup>47</sup> Jacques Lacan, *The Seminar of Jacques Lacan*, book 11, *The Four Fundamental Concepts of Psychoanalysis*, ed. Jacques-Alain Miller, trans. Alan Sheridan (New York: W. W. Norton, 1981), 22, translation modified; Jacques Lacan, *Les quatre concepts fondamentaux de la psychanalyse, Le séminaire, 11*, ed. Jacques-Alain Miller (Paris: Seuil, 1973; reprint, Paris: Points, 1990), 30.

<sup>48</sup> Robert J. Richards, *The Meaning of Evolution: The Morphological Construction and Ideological Reconstruction of Darwin's Theory* (Chicago: University of Chicago Press, 1992), 171, italics in original.

history of the individual organism. This is the standard figure of the recapitulation hypothesis—at one point the embryo more or less is an adult fish that existed in the past. By contrast, the “cenogenetic process” is the “vitiating of the history of the germ.” In Haeckel’s words, this concept is “applied to all such processes in the germ-history as are not to be explained by heredity from primeval parent-forms, but which have been acquired at a later time in consequence of the adaptation of the germ, or embryo form, to special conditions of evolution.”<sup>49</sup> In other words, adaptation itself—the putative motor of natural selection—is what *vitiates* (Haeckel’s own word) the purity of palingenetic recapitulation. An example of a cenogenetic instance is the embryo’s dependence on the placenta; the fossil record shows no instance of independently existing adult creatures in placentas. Rather, the advent of the placenta is discretely connected to the evolution of a species as an adaptive measure that has no special relationship to that species’ phylogenetic history.

In effect, Haeckel has gotten himself in the peculiar situation of recognizing the motor of natural selection as precisely what *attenuates* the effectiveness of his recapitulation hypothesis.<sup>50</sup> How can phylogeny be the mechanical cause of ontogeny if accumulating adaptations at the ontogenetic level are what serve to compress and, ultimately, alter the phylogenetic trajectory? This is an immanent conception of causality in which the effect so overdetermines its putative cause that “cause” loses all explanatory sense. But Haeckel persists, seeing in “vitiating evolution” not the tenuousness of his theory but its tenacity. He says as much himself when he writes:

It is only by critically appreciating these cenogenetic incidents in relation to the palingenetic, and by constantly allowing for the changes in inherited evolution effected by vitiating evolution, that it is possible to recognize the *fundamental* significance of the *first* principle of Biogeny, which in this way attains its *true value* as the most important explanatory principle of the history of evolution. When it is thus critically appreciated, this first principle also proves to be the “red thread” on which we can string every one of the phenomena in this wonderful domain; this is the thread of Ariadne, with the aid of which alone we are able to find an intelligible course through this complicated labyrinth of forms.<sup>51</sup>

In other words, it is only by recognizing all the ways in which the theory is wrong that we are able to recognize the singular way in which it is right. Haeckel insists upon our proximity to our primordial nature and delights in the indistinction between the human and the dog embryo. He actively desires similarity over differentiation, and this is why, in the end, heredity always overwhelms and displaces adaptation in Haeckel’s vision. Heredity is the “red thread,” the “first principle.” But when this concept is pushed to its logical conclusion, the conclusion is ultimately vacuous; the common ancestry is a formless primordial nature, as singular, universal, and powerful as the God it insists it has dethroned.

If adaptation is about the *transience* of forms—morphology as inexorable algorithm—heredity is about the *persistence* of the unformed, adaptation’s remainder. The schism between Darwin’s and Haeckel’s concepts is legible in the simple fact that *The Origin of Species* effectively undid the concept of species as such, affirming its transient, if not purely nominalist, quality, whereas

<sup>49</sup> Haeckel, *Evolution*, 1:10. Cf. Depew and Weber, *Darwinism Evolving*, 179: “He assigns natural selection the negative role of eliminating novelties that fail to ensure progressive evolution.”

<sup>50</sup> Gould, *Ontogeny and Phylogeny*, 167ff.

<sup>51</sup> Haeckel, *Evolution*, 1:14, italics added.



Haeckel's entire effort was geared toward discerning the figures of fixed species in the spatial representation of a temporal ontogenesis.<sup>52</sup> For Haeckel, tracking this genesis was a source of inspiration, affirming a closeness to oceanic nature that in many instances appears to be a striking precursor to Freud's death drive. Here, origin is indeed the goal. And it is this conceptual figure, rendered so explicit in the Haeckelian contribution to Darwinism, that we also find in contemporary theory and its antecedents in twentieth-century European thought. Phenomenology moves from a return to the lifeworld to returns to myriad other primordial instances: thrownness, the flesh of the world, auto-affective life.<sup>53</sup> In each case thought tends toward a recapitulative access to the primordial instance in order to redeem its practices in the present. But self-professed antiphenomenologists are liable to the same charge. For Deleuze, the goal of thought is to restore its vocation in the "univocity of being," finding restoration in a "single and same Ocean for all the drops."<sup>54</sup> For Badiou, confrontation with the primordial void is the condition for any authentically subjective accomplishment. In the end, however, it is hard to tell what the conceptual difference is between a total metaphysical excision of historical time and its maximal recapitulation in the fleeting instance of the originary void's presence in what Badiou terms the Event.<sup>55</sup> As for Slavoj Žižek, the same point about the void holds, but here the Haeckelian specter arguably looms larger than Žižek's own professed Hegelianism. His own intellectual itinerary—from Kant to Schelling to Hegel—might be aptly, if crassly, distilled in a simple formula: ontogeny recapitulates phylogeny recapitulates cosmogony.<sup>56</sup>

It is doubtful that any of these professed "materialists" would argue with the basic tenet of Darwin's "dangerous idea," the algorithmic unidirectional quality of time, a vision shared incidentally by Haeckel's contemporary the physicist Ernst Mach in his conviction that the universe is a one-way street whose complement in a mirror does not exist.<sup>57</sup> But their work betrays the desire for a reflection that is not forthcoming; even Dennett himself is not totally exempt from this charge in his conviction that there is an algorithm that must possess some logical, if not temporal, priority, even if that algorithm can never be known. It is this inexorability combined with unknowability that raises the intensity of Darwin's acid to an unbearable level. But this unbearable quality has the potential to be theoretically salutary, not unlike the way in which various austere formalisms of an earlier moment were salutary in the correctives they offered to variously metaphysical conceptions of philosophy, history, and literature.<sup>58</sup> The putative nihilism of this moment finds an unlikely echo in the manifest destruction of metaphysical meaning that results

<sup>52</sup> On this nominalism, see John Beatty, "Speaking of Species: Darwin's Strategy," in *The Darwinian Heritage*, ed. David Kohn (Princeton, NJ: Princeton University Press, 1985), 265–81.

<sup>53</sup> Beyond Heidegger, see, in the French context, Maurice Merleau-Ponty, *The Visible and the Invisible*, ed. Claude Lefort, trans. Alphonso Lingis (Evanston, IL: Northwestern University Press, 1968); and Michel Henry, *Material Phenomenology*, trans. Scott Davidson (New York: Fordham University Press, 2008).

<sup>54</sup> Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (New York: Columbia University Press, 1994), 304.

<sup>55</sup> Alain Badiou, *Being and Event*, trans. Oliver Feltham (London: Continuum, 2005).

<sup>56</sup> This schema is legible, even if it is unintended, in the argument and indeed the very structure of Adrian Johnston, *Žižek's Ontology: A Transcendental Materialist Theory of Subjectivity* (Evanston, IL: Northwestern University Press, 2008).

<sup>57</sup> This aspect of Mach's thought is emphasized in Clément Rosset, *L'objet singulier* (Paris: Minuit, 1985), 22.

<sup>58</sup> In addition to the classics of postwar structuralism, see Peter Hallward and Knox Peden, eds., *Concept and Form*, vol. 1, *Key Texts from the "Cahiers pour l'Analyse"* (London: Verso, 2012); and Peter Hallward and Knox Peden, eds., *Concept and Form*, vol. 2, *Interviews and Essays on the "Cahiers pour l'Analyse"* (London: Verso, 2012).

from Darwin's dangerous idea.<sup>59</sup> But this destruction of meaning was always intended to yield new openings to the future that might overcome a debilitating nostalgia for the past. And yet the fortitude of this nostalgia is on display throughout the vitalisms and materialisms of contemporary thought. These currents can no doubt find sustenance in a passage of Goethe's that Haeckel himself cited to conclude *The Riddle of the Universe*:

By eternal laws  
Of iron ruled,  
Must all fulfill  
The cycle of their destiny.<sup>60</sup>

Destiny *as future* is forsaken for destiny as cyclical *return*. A universal acid is neutralized by an alkaline recapitulation. [A]

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<sup>59</sup> Cf. Hägglund ("Arche-Materiality of Time," 273), who also regards Dennett's project as valuable precisely insofar as it "devitalizes life" rather than "vitaliz[es] matter."

<sup>60</sup> Haeckel, *Riddle*, 383.